



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/716,950	11/19/2003	Young Hoon Park	YPL-0069	7281
23413	7590	12/12/2006		
CANTOR COLBURN, LLP 55 GRIFFIN ROAD SOUTH BLOOMFIELD, CT 06002			EXAMINER STOUFFER, KELLY M	
			ART UNIT	PAPER NUMBER

1762

DATE MAILED: 12/12/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/716,950

Applicant(s)

PARK ET AL.

Examiner

Kelly Stouffer

Art Unit

1762

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 20 November 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-6 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-6 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Response to Arguments

Applicant's arguments regarding the specification and drawings, filed 20 November 2006 have been fully considered and are persuasive. The objections of the specification and drawings have been withdrawn.

Applicant's arguments with respect to claims 1-6 have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of

Art Unit: 1762

the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent Application Publication number 2003/0003635 A1 to Paranjpe et al. in view of US Patent 6723598 to Lim et al.

Paranjpe et al. includes a method of depositing an aluminum oxide thin film on a wafer by atomic layer desorption (ALD) in paragraph 0009 lines 1- 5 in a chamber that contains a reactor block for the substrate or wafer block shown as heated chuck 204 in Figure 2. A top lid and showerhead with a plurality of holes to deposit two different reactant gases is shown as multi-zone showerhead 203 in Figure 2 and contains showerhead zones 203A and 203B described in paragraph 0036 lines 5-13. The chamber 201 in Figure 2 is pumped down to 10^{-6} torr as described in paragraph 0035 lines 18-19, confirming that the multi-zone showerhead 203 in Figure 2 indeed acts as a top lid to maintain a predetermined pressure within the reaction vessel. The wafer or substrate 101 in Figure 1 is mounted on a reaction block or heated chuck 204 and is heated to a temperature of 60-350 °C as described in paragraph 0031 lines 5-6. An aluminum oxide film is deposited by ALD as described in paragraph 0009 et seq, and

Art Unit: 1762

another embodiment is disclosed in paragraph 0033 et seq. With regard to the embodiment in paragraph 0033, an oxidant (ozone as mentioned in paragraph 0032 line 6) is deposited on a film using a carrier gas from showerhead zone 203 B in paragraph 0036 et seq. The process chamber is purged with a high flow of inert gas out of the same showerhead zone by vacuum purging due to the presence of turbo molecular pump 220 in Figure 2 then is dosed with a precursor (trimethylaluminum in paragraph 0030 lines 3-4 that is at room temperature in a canister or trimethylaluminum source 215 in Figure 2 as described in paragraph 0036 lines 1-2) transported by a carrier gas from showerhead zone 203 A in paragraph 0036 et seq. The chamber is purged once more with inert gas through the same showerhead zone by vacuum purging due to the presence of turbo molecular pump 220 in Figure 2. The process may be repeated to achieve desired film thickness in paragraph 0033 lines 19-21. Paranjpe et al. does not include spraying an inert gas through showerhead zone 203 A while the ozone is sprayed through 203 B nor does Paranjpe et al. include spraying an inert gas through showerhead zone 203 B while TMA is sprayed through 203 A. Paranjpe et al. teaches that care should be taken to ensure that precursor and oxidant never co-flow into the chamber, a common delivery line such as showerhead zones 203 A or 203 B, or into an exhaust line in order to prevent alumina powder formation as described in paragraph 0041 lines 7-14. In order to prevent alumina powder formation in a common delivery line such as showerhead zones 203 A or 203 B one of ordinary skill in the art would realize the importance of avoiding cross-contamination of the showerhead zones by oxidant and reactant. If inert gas were not flowing through the second showerhead

Art Unit: 1762

zone while the first was depositing either oxidant or reactant, the second showerhead zone would become contaminated by the oxidant or reactant flowing out of the first.

Therefore, in order to prevent cross-contamination of the showerhead zones and delivery lines as required by Paranjpe et al., one of ordinary skill in the art would deduce that inert gas must be flowing out of a showerhead zone while the other showerhead zone is spraying oxidant or reactant.

It would have been obvious to one of ordinary skill in the art at the time of invention to modify Paranjpe et al. to explicitly include flowing inert gas out of one showerhead zone while the other was being used to spray oxidant or reactant in order to prevent co-flow of oxidant and reactant into the delivery system and consequent formation of alumina powder on the showerhead.

Paranjpe et al. does not teach vacuum purging between deposition. However, Lim et al. teaches that it is suitable to use either purging with an inert gas as in Paranjpe et al. or vacuum purging to remove unreacted precursors between pulses of gases in an ALD process (column 2 lines 21-35).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Paranjpe et al. to include vacuum purging between pulses of gases in the ALD process as taught by Lim et al. in order to remove unreacted precursors between pulses.

Art Unit: 1762

Paranjpe et al. does not include values for the flow rates or duration of exposure of the ozone, carrier, purge, and TMA gases. Nor does Paranjpe et al. include the concentration of the ozone gas, which would also depend upon pressure and flow rate, and Paranjpe et al. gives the capacity of the TMA container as 35 psig which is about $48 \text{ cm}^3/\text{mol}$, resulting in a conceivable range of $500\text{-}3000 \text{ cm}^3$ depending on the number of moles of TMA. Paranjpe et al. teaches in paragraph 0031 et seq. that the values of flow rates and duration for each step of the ALD process depend upon the apparatus and conditions employed in the invention and their importance is only to achieve a desired aluminum oxide film quality. The values of flow rates and duration for each step are therefore result-effective and are not inventive.

It would have been obvious to one of ordinary skill in the art at the time of invention to modify Paranjpe et al. to include values of flow rates for ozone, carrier, purge and TMA gas to be in the range of $50\text{-}1000 \text{ sccm}$ with an ozone concentration of at least 100 g/cm and to include the duration of the steps to be within $0.1\text{-}4$ seconds or $0.1\text{-}3$ seconds depending on the ozone or TMA step, respectively, absent any criticality for utilizing the claimed values in order to achieve a desired aluminum oxide film quality.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

Art Unit: 1762

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kelly Stouffer whose telephone number is (571) 272-2668. The examiner can normally be reached on Monday - Thursday 7:00-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy Meeks can be reached on (571) 272-1423. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.


TIMOTHY MEEKS
SUPERVISORY PATENT EXAMINER

Art Unit: 1762

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Kelly Stouffer
Examiner
Art Unit 1762

kms